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(54) IMPROVEMENTS IN OR RELATING TO COFFEEMAKERS

(71) We, SUNBEAM CORPORATION, a corporation organized and existing under the laws of the State of Delaware, United States of America, of 5400 West Roosevelt Road, Chicago, Illinois 60650, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to electric coffee makers and, more particularly, is concerned with pressure-type coffeemakers, especially, but not exclusively, those which are suitable for preparing expresso coffee. Expresso coffeemakers in general are constructed with a lower vessel having a water-containing section into which the proper amount of water is poured and an upper vessel which is secured to the lower vessel. A container for holding coffee grounds is located in a passageway intermediate the upper and lower vessels. A pipe extends upwardly into the container from the lower chamber so that steam pressure generated in the lower chamber can force water up from the lower vessel into contact with the coffee grounds in the coffee container. A second pipe extends upwardly in the upper vessel whereby the percolate liquid which is forced through the coffee grounds is supplied to the upper vessel for storage. Such a coffeemaker also contains a plurality of parallel and perforated discs or diaphragms which are used to filter out coffee grounds from the percolate.

Coffeemakers of the type described have generally been heated by an external source of heat such as a gas burner or a stove. Under modern living conditions it is not desirable to require that an external source of heat be provided to heat a coffeemaker because of the convenience of electricity. Electrical pressure-type coffeemakers have previously been developed. For example, an electric pressure-type coffeemaker is shown in Patent Specification No. 976,601. In this coffeemaker, as in other prior coffeemakers of the type described, the heating element extends directly into the water in the lower vessel. When the heating element is inserted directly in the water in the lower vessel mineral deposits may build up and can adversely affect the taste of the coffee. In addition there is likely to be an increased safety hazard with such an arrangement.

In order to reduce these above described problems, the present invention provides an electric coffeemaker comprising an upper and a lower vessel for receiving brewed coffee and water respectively, coupling means for releasably securing said lower vessel to said upper vessel in a fluid tight manner, a brewed coffee delivery tube extending within said upper vessel and opening toward said lower vessel, a container for coffee grounds so disposed that in use water passing from said lower vessel to said delivery tube can pass therebetween only through said container and having a water entry tube which extends towards the bottom of said lower vessel whereby, in use, water can be forced by pressure from the lower vessel through the coffee grounds in said container and then through said delivery tube into said upper vessel, an electrical heating element in good heat transfer relation with the underside of the bottom of said lower vessel, and a normally closed thermostatic switch mounted on the underside of the bottom of said lower vessel and electrically connected in series with said heating element, said thermostatic switch being operative to provide overheating protection for said coffeemaker and to keep the contents of said upper vessel within a predetermined temperature range.

Preferably the heating element is C-shaped.

Preferably the thermostatic switch comprises a single bi-metallic thermostatic switch which is placed in contact with the underside of the base of the lower vessel. The positioning of this switch is of importance since the thermostat is to perform a keep-warm function as well as to provide for overheating protection. It has been found that the desired type of operation is achieved when the thermostatic switch is placed in-

side the C-heating element between the inner periphery of the C-shaped heating element and a circular mounting boss that is loacted at the center of the base of the lower vessel.

It will be seen that the present invention provides an electric coffeemaker with an electric heating mechanism that protects the coffeemaker against overheating and also functions to keep brewed coffee warm.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying drawings, in which:—

Figure 1 is a perspective view of an electric coffeemaker in accordance with the present invention;

Figure 2 is a perspective assembly drawing of the coffeemaker of Figure 1 showing the assembled relationship of the upper and lower vessels and the container for the coffee grounds;

Figure 3 is a cross sectional view of the coffeemaker taken along the lines 3—3 of Figure 1; and

Figure 4 is a cross sectional view of the heating section of the coffeemaker taken along the lines 4—4 of Figure 3.

Referring to the drawings, there is shown an electric coffeemaker designated generally by the reference numeral 10 shown in Figure 1. The coffeemaker 10 is constructed of a lower vessel 12 and an upper vessel 14 which are releasably interlocked together during operation to prevent the escape of steam from the lower vessel 12. The interlocking engagement of the lower vessel 12 and the upper vessel 14 is achieved by the twisting of the vessels with respect to each other. The vessels are released from engagement by the twisting of the two vessels in a direction opposite to the direction of twist employed to lock them together.

Water may be introduced into the lower vessel 12 when the upper vessel 14 is removed from the lower vessel 12. After water has been introduced into the lower vessel 12, the upper vessel 14 and the lower vessel 12 are locked together. The lower vessel 12 has an electrical heating assembly 16 that is secured to the base of the water-containing section 13 of the lower vessel 12. Electrical energy is supplied to the coffeemaker 10 through the electrical plug and cord 18. The container 20 for the coffee grounds is secured in place in the top of the lower vessel and the steam that is generated by heating of the water in the lower vessel 12 forces liquid up through the coffee in the container 20 and into the upper vessel 14.

After the water has been forced up into the upper vessel 14 leaving the lower vessel 12 and section 13 virtually empty, the heating assembly 16 causes the base of the section 13 of the lower vessel 12 to reach a predetermined elevated temperature, at which time the thermostatic switch operates to open the electrical circuit including heating assembly 16. The upper vessel 14 and lower vessel 12 are formed of die cast metal having good heat conducting characteristics so that the heat produced by the heating assembly 16 is transmitted to the upper vessel 14 to keep the brewed coffee warm. The thermostatic switch cycles at a temperature such that with the lower vessel 12 empty, the brewed coffee in the upper vessel 14 is maintained at a substantially constant elevated temperature.

The line cord 18 may be removed from the coffeemaker by removal of the female plug 22 from the heating assembly 16 when serving the coffee that is prepared in the coffeemaker 10. An insulated handle 24, which is preferably formed of plastics material, is provided to lift the entire coffeemaker 10 in order to pour the coffee percolate through the spout 26 into a cup. The plastics handle 24 is secured to the upper vessel 14 by means of screws 62 and 64 which are screwed into corresponding threaded portions of the upper vessel 14. A cover 28 for the upper vessel 14 fits into the upper vessel 14 and is provided with a handle or knob 30 to permit access to the interior of the upper vessel 14.

The structure by means of which the upper vessel 14 and the lower vessel 12 are interlocked together is shown in Fig. 2. The lower vessel 12, which is supported on the legs 32, has an upper circular rim portion 36 which surrounds the interior opening to the lower vessel 12. Extending outwardly from the circular rim 36 are locking ledges 38 and 40 which have inclined surfaces 42 and 44 respectively. The upper vessel 14 similarly has a pair of locking ledges 46 and 48 which are also provided with corresponding mating inclined surfaces 50 and 52 for providing frictional engagement with the surfaces 42 and 44. The surfaces 42, 44, 50 and 52 are inclined so that when the two vessels are rotated in one direction relative to each other the vessels 12 and 14 will be locked together and when the two vessels are rotated in the opposite relative direction the two vessels will be released from engagement.

The underside of the upper vessel 14 is provided with a perforated circular filter disc 54 which is surrounded by a sealing gasket 55. The sealing gasket is received in an inwardly facing annular groove in vessel 14 (see Fig. 3) whereby the filter disc 54 and the gasket 55 are retained in assembled relation to the upper vessel 14 during normal usage but are easily removed for washing purposes. The filter disc 54 serves as a filter enclosure over the coffee container 20 and prevents the coffee grounds from being car-

ried up into the upper vessel 14 by the coffee percolate as it is forced from the lower vessel 12 to the upper vessel 14. The locking action of the ledges 38, 40, 46 and 48 causes the gasket 55 to be clamped between the vessels 12 and 14 providing an effective seal. The upper lip 56 of the container 20 is sloped upwardly and it abuts against the sloping ledge 57 of the rim 36 of the lower vessel 12 when the coffeemaker 10 is assembled.

The upper vessel 14 has a centrally located percolator funnel 58 which is integrally formed with the base of the upper vessel 14. A semi-circular downwardly sloping slot 60 is provided in the upper portion of the funnel to allow for passage of the coffee percolate from the funnel 58 into the interior of the upper vessel 14 for storage.

The coffee container 20 has a cylindrical side wall 78, a funnel-shaped surface 70 extending from the side wall 78 and a hollow pipe 66 extending downwardly from the surface 70 for receiving heated water from the lower vessel 12. A removable lower filter disc 68 is provided for the coffee container 20. The filter disc 68 is secured in place over the funnel-shaped surface 70 of the coffee container 20. The filter disc 68 is provided with a centrally located upstanding handle 72 and with one or more notches 74 on its outer periphery. One or more corresponding lugs 76, extend inwardly from the side wall 78 of the coffee container 20. The filter disc 68 may then be removed by twisting the handle 72 so that the notch 74 and the lug 76 are in alignment, when it is desired to clean the surface 70 of the coffee container 20. It has been found that if the surface 70 is not periodically cleaned that an undesirable accumulation tends to build up on this surface which may adversely affect the flavor of the coffee made in the coffeemaker 10.

The cross sectional views of Fig. 3 and 4 show the heating assembly 16 in detail. The female plug 22 which conducts electrical energy to the heating assembly 16 is inserted into the opening 80 in the heating assembly 16 to receive the male connecting terminals 82. The heating assembly housing 84 is preferably formed of a plastics material which provides heat insulation from the hot base portion 86 of the lower vessel 12 so that the coffeemaker may be placed on various heat sensitive surfaces that are found in a house or office on which a hot coffemaker could not otherwise be placed.

The housing 84 for the heating assembly 16 has a notched annular surface 88 which receives the bottom edge of the annular downwardly-extending rim 90 of the lower vessel 12. A metallic mounting post 92, which is threaded at one end is secured in the mounting boss 94 on the base 86. A mounting nut 95 and an associated washer 96 are provided for the lower threaded end of the mounting post 92 to secure the housing 84 in place. The nut 95 is recessed in the indention 98 in the base 100 of the housing 84 to prevent marring of the surface on which the coffee-maker is placed. The male connecting terminals 82 are held in place by U-shaped receiving sockets 102 that are formed integrally with the base 100 of the housing 84.

In order to provide for uniform and accurate heating of the coffeemaker 10, a C-shaped heating element 104 is molded integrally with the base 86. The heating element 104 is preferably of the well-known sheath type. It may be formed of a high resistance wire 106 which is surrounded by compacted electrically insulating powder such as fused magnesium oxide 108. The magnesium oxide 108 is enclosed in a tubular steel sheath 109 which is formed to a C-shaped configuration and cast into a rib projecting from the die cast lower vessel 12. The coiled C-shaped heating resistance wire 106 is preferably a resistance wire that is sold under the Registered Trade Mark "Nichrome". The C-shaped heating element 104 is positioned so that it encircles the centrally-located boss 94 with a radius sufficient to allow for the positioning of the control thermostat 110 in contact with the underside of the base 86 intermediate the inner periphery 112 of the rib enclosing the heating element 104 and the outer periphery 114 of the boss 94.

In the illustrated embodiment, the thermostatic switch 110 has a generally elliptically shaped mounting plate 111 with the holes 113 and 115 provided therein for receiving the mounting screws 117 and 119. Mounting posts 118 for receiving the screws 117 and 119 are provided which may be formed integrally with the base 86 or they may be removably positioned thereon. The screws 117 and 119 are received into corresponding threaded portions of the base 86 in such a manner that the mounting screws do not project through the base 86 into the water-containing section 13. This is to ensure that the lower vessel 12 remains completely sealed and that the accumulation of deposits in the water-containing section 13 is minimized.

Electrical connection is made to the connectors 120 of the thermostatic switch 110 by means of the electrical leads 122, 124 and 126. As shown in Fig. 4 these connections provide a current path such that the heating element 104 is connected in series with the normally closed switch 110. By placing the thermostatic switch 110 intermediate the boss 94 and the heating element 104 an accurate sensing of the temperature of the base 86 may be achieved. The placing of the switch 110 near the heating element 104 ensures quick response. When the temperature

of the coffeemaker reaches a predetermined temperature the switch 110 opens the heating circuit, and the coffeemaker 10 cools off. However, the switch 110 will again close when the temperature has decreased to a lower predetermined temperature. The temperature of the base 86 will thereafter cycle within a predetermined temperature range thereby keeping the contents of the coffeemaker 10 warm. The thermostatic switch 110 also protects the coffeemaker 10 from overheating when insufficient water is in the lower vessel 12.

A conventional safety valve 128 is also provided in the lower vessel 12 to release steam pressure if the steam pressure in the lower vessel 12 reaches a predetermined value. The coffeemaker described with reference to the drawings is able to operate at relatively low steam pressures and to utilize a relatively low pressure safety valve because the coffee container 20 has a relatively large diameter and the coffee grounds in the coffee container 20 are rather loosely packed, which allows for relatively free passage of heated water from the lower vessel 12 to the upper vessel 14.

During operation of the illustrated coffeemaker embodying the present invention the steam pressure in the lower vessel 12 preferably builds up to approximately 50 p.s.i.g. The safety valve 128 is preferably designed to actuate at a pressure of 90—100 p.s.i.g. Thus the relief pressure of the pressure valve 128 of the coffeemaker 10 in the preferred embodiment of the present invention may be below the operating pressure of many conventional coffeemakers of the described type thereby providing an added safety feature for the coffeemaker 10.

As will be evident from the description presented above, the coffeemaker 10 is extremely simple in structure and design while at the same time having functional advantages heretofore unknown in the art. Although utilizing a single electrical heating element 104 and a simple normally closed thermostatic switch 110, there is provided a coffeemaker which automatically brews expresso type coffee and later maintains it warm at a drinkable temperature without the use of any secondary heating elements, keep warm thermostats or the like which are normally necessary to accomplish these functions.

The die cast construction of the lower vessel 12 with the sheathed heating element 104 cast integrally therewith provides an arrangement in which the heating element 104 may quickly and efficiently heat the water in the lower vessel 12 during the brewing operation. As the steam generated within the lower vessel 12 forces the water through the coffee ground container 20 and then upwardly through the funnel 58 into the upper vessel 14, the heat from the element 104 is transmitted through the die cast walls of the lower vessel 12 to the upper vessel 14 thereby warming the upper vessel 14 within which the brewed coffee is received. Although there is some heating loss in conducting the heat to the upper vessel 14, frictionally engaged interlocking ledges 38, 40, 46 and 48 provide a good path for heat conduction into the die cast upper vessel 14.

Following transfer of the heated water from the lower vessel 12 to the upper vessel 14 through the coffee grounds in the coffee container 20, the lower vessel 12 begins to heat up rapidly because of the absence of any substantial amount of water in it. Without water, the lower vessel 12 would soon become overheated if the electrical power were continuously supplied to the heating element 104. In order to protect the coffeemaker from damage the thermostat 110 opens the heating element circuit to the heating element 104 when the base 86 of the lower vessel 12 rises to approximately 305°F.

In the present coffeemaker, the coffee liquor that is present in the upper vessel 14 is maintained at a drinkable temperature after it has been transferred into the upper vessel. The single thermostat 110 also accomplishes this purpose by closing the heating circuit when the temperature of the base 86 of the lower vessel 12 falls to approximately 255°F. The side walls of both the lower vessel 12 and the upper vessel 14 and the locking ledges 38, 40, 46 and 48 are formed of fairly thick die cast aluminium. The side walls of the lower vessel 12 and the upper vessel 14, for example, have a minimum thickness of at least 0.115 inches. As a result, adequate heat conduction is achieved from the heating element 104, through the base 86, the side wall of the lower vessel 12, the locking ledges 38, 40, 46 and 48, and the side wall of the upper vessel 14 to the coffee liquor that is stored in the upper vessel 14 to maintain the coffee liquor at a drinkable temperature after it has been prepared. The thermostat 110 continues to cycle on and off continuously in a manner such that the temperature of the base 86 is held to a maximum temperature of approximately 305°F and is not allowed to fall below a minimum temperature of approximately 255°F. The temperature of the brewed coffee in the vessel 14 will then remain at approximately 190°F while the coffeemaker is coupled to a supply of electrical energy and the thermostat 110 cycles to keep the base 86 within the above-noted temperature range.

WHAT WE CLAIM IS:—

1. An electric coffeemaker comprising an upper and a lower vessel for receiving brewed coffee and water respectively, coupling means for releasably securing said lower

vessel to said upper vessel in a fluid tight manner, a brewed coffee delivery tube extending within said upper vessel and opening toward said lower vessel, a container for coffee grounds so disposed that in use water passing from said lower vessel to said delivery tube can pass therebetween only through said container and having a water entry tube which extends towards the bottom of said lower vessel whereby, in use, water can be forced by pressure from the lower vessel through the coffee grounds in said container and then through said delivery tube into said upper vessel, an electrical heating element in good heat transfer relation with the underside of the bottom of said lower vessel, and a normally closed thermostatic switch mounted on the underside of the bottom of said lower vessel and electrically connected in series with said heating element, said thermostatic switch being operative to provide overheating protection for said coffeemaker and to keep the contents of said upper vessel within a predetermined temperature range.

2. A coffeemaker as claimed in claim 1, wherein said upper and lower vessels and said coupling means provide good heat transfer between said heating element and said upper vessel whereby said element maintains brewed coffee in said upper vessel hot when said lower vessel is empty of water and said thermostatic switch is operating to prevent overheating of said coffeemaker.

3. A coffeemaker as claimed in claim 1 or 2, wherein said upper and lower vessels are cylindrical aluminium vessels and have wall thicknesses not less than 0.115 inches.

4. A coffeemaker as claimed in claim 1, 2 or 3, wherein said coupling means comprises peripherally extending, interlocking ledges formed on said upper vessel and on said lower vessel, said ledges being formed integrally with their respective vessels, said upper vessel ledges and said lower vessel ledges engaging over substantial areas thereof to facilitate heat transfer from said lower vessel to said upper vessel.

5. A coffeemaker as claimed in any preceding claim, wherein said heating element is C-shaped and said thermostatic switch is mounted within the inner periphery of said C-shaped heating element.

6. A coffeemaker as claimed in any preceding claim, wherein said thermostatic switch is screwed to the underside of the bottom of said lower vessel.

7. A coffeemaker as claimed in any preceding claim, wherein said lower vessel is mounted on a housing member made of plastics material, said housing member and the bottom of said lower vessel together surrounding said thermostat.

8. A coffeemaker as claimed in claim 7, wherein said housing member is secured to the lower vessel by means of a downwardly extending boss at the center of said bottom of said lower vessel and an elongated rod, one end of said rod being secured to said downwardly-extending boss and the other end of said rod projecting through an aperture in a base of said housing, and securing means on said projecting end of said rod for securing said base on said coffeemaker.

9. A coffeemaker as claimed in claim 7 or claim 8 wherein said lower vessel has a downwardly extending annular rim and said housing member has an upwardly extending annular notched surface a portion of which abuts the lower surface of said annular rim.

10. A coffeemaker as claimed in any preceding claim wherein said heating element is integrally moulded in the bottom of said lower vessel.

11. A coffeemaker as claimed in any preceding claim wherein the container for the coffee grounds comprises a cylindrical wall, and a funnel-shaped section that slopes downwardly from a lower end of said cylindrical wall, said water entry tube extending downwardly from an aperture at the center of said funnel-shaped section for supplying water, in use of the coffeemaker to coffee grounds in said container, said container also comprising at least one inwardly projecting ridge and a removable circular filter disc comprising a notch on its outer periphery, said filter disc also comprising an upwardly projecting handle, said notch on said disc and said ridge being related so that rotation of said filter disc by manipulation of said handle so as to provide for alignment of said notch and said ridge allows said filter disc to be removed from said container when it is desired to clean said funnel-shaped section.

12. An electric coffeemaker substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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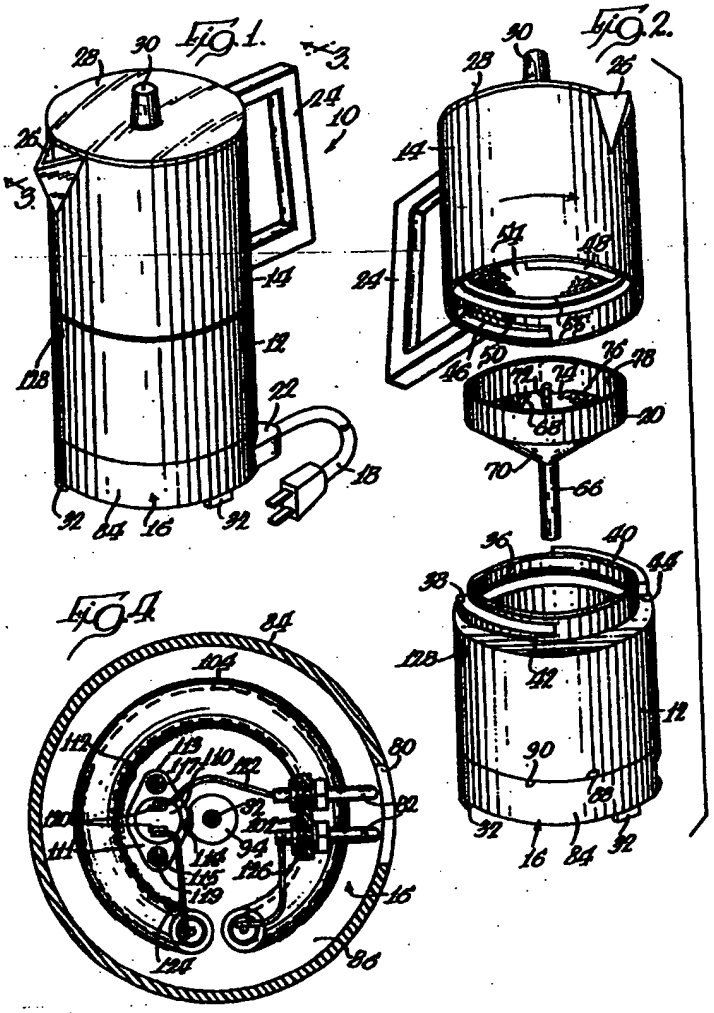

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Sheet 2

Fig.3.